A taxonomic review of the genus *Agrostocrinum* (Phormiaceae)

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Abstract

G.J. Keighery, A taxonomic review of the genus *Agrostocrinum* (Phormiaceae). *Nuytsia* (15)2: 245–252 (2004). The genus *Agrostocrinum* F. Muell. is reviewed. Two species are recognised, *A. hirsutum* (Lindl.) Keighery and *A. scabrum* (R. Br.) Baillon, both confined to southern Western Australia. A distinctive inbreeding maritime race of the latter, found in scattered populations on granites along the south coast, is described as a new subspecies, *A. scabrum* subsp. *littorale* Keighery.

Introduction

This paper is the second part of a series dealing with the taxonomy of the Western Australian Liliaceae *sens. lat.*, arising from the author's extensive studies on the biology of these plants. The first (Keighery 2004) dealt with a new species of *Bulbine* Willd.

The genus *Agrostocrinum* (Phormiaceae) is endemic to south Western Australia. Although a distinct genus, it is related by chemical, leaf anatomy, seed and cytological characters to *Dianella* Lam. and has been recently placed in the family Phormiaceae (Dahlgren *et al.* 1985). In his treatment of the genus for "Flora of Australia", Henderson (1987) maintained a single widespread species, *A. scabrum*. Extensive field observations by the current author have led to this review in which two largely allopatric species are recognized, one of them with two subspecies.

Biology of the genus

Members of the genus *Agrostocrinum* are short-lived tufted rhizomatous herbs, that grow and flower rapidly from seed, and flowering can occur the next spring after germination. Although possessing a short rhizome, both species, like *Stypandra* R.Br. (Pate & Dixon 1982), have tuberous roots as storage organs.

Plants can survive and resprout after mild fires but are generally killed by hot summer fires and regenerate from seed. *Agrostocrinum hirsutum* is stimulated to germinate and grow after fire and occurs in large populations for 4–7 years after fire in the southern forests. On shallow soils in the northern Jarrah forest, large numbers of plants of *Agrostocrinum hirsutum* died during the series of hot dry summers

and drought affected autumns of 2000/2001, suggesting that they are comparatively short lived. At the Brixton Street wetlands plants of *A. scabrum* were at least 8 years old before being killed by a summer fire.

Agrostocrinum has diurnal, nectarless flowers with poricidal anthers that, like those of *Dianella* and *Stypandra* are buzz-pollinated by solitary bees. Normally only a few flowers are open on a single plant per day, ensuring several plants are visited in the normally large populations of both species.

Unlike *Dianella* the genus is largely self-incompatible, with black anthers that are twisted away from the style preventing self-pollination, except in the case of the new maritime subspecies. In this inbreeding taxon the anthers are straight and level with the style, which is closely surrounded by the anthers. This subspecies also can be clonal in its growth habit, like members of the related genus *Stypandra*. While most populations of both species are diploid (n=8) at least in the case of the Cape Leeuwin population the maritime taxon is polyploid on n=16 (Keighery 1984).

Agrostocrinum also differs from *Dianella* in producing capsules not berries. The shiny black seeds are dispersed from the capsule in early summer in both species.

Taxonomic treatment

Agrostocrinum F. Muell. , Fragm. 2: 94 (1860). *Type: Agrostocrinum stypandroides* F. Muell.

Tufted *perennials* with a number of flowering stems annually renewed from a short or rarely elongated rhizome 10–40 cm diam., rarely elongated to over 1 m. *Roots* tuberous (not fibrous as frequently stated), slender, yellow brown or yellow when alive. *Aerial stems* erect, not or few-branched, flattened, both margins entire. *Leaves* distichously inserted at base, concentrated on lower part of the stem, linear, parallel-veined, basally strongly compressed, ensiform, unifacial, then v-shaped and finally open and flat towards apex, apex acute. *Inflorescence* terminal, a continuation of the aerial stems, unbranched or more or less corymbose, bracteate, glabrous or scabrid. *Main bract* leaf-like, linear. *Pedicels* glabrous or scabrid. *Flowers* bisexual, slightly zygomorphic, pedicellate. *Perianth segments* 6, subequal, slightly united at the base, where thickened and persistent, upper parts membranous, twisted after flowering then deciduous, blue; sepals glabrous on inner surface, sometimes scabrid on outer surface; petals slightly larger than sepals, glabrous. *Stamens* 6, black, shorter than perianth, straight or curved away from style; filament glabrous; anther longer than the filament, tapering upwards, dehiscing by pores, introse, shortly appendaged basally. *Ovary* superior, 3-locular; ovules 2 per locule, basal. *Style* filiform, straight or curved to one side; stigma minute, papillose. *Fruit* a loculicidal capsule, more or less globose but crested, subtended by the persistent perianth base, either scabrid or glabrous. *Seeds* 1 or 2 per locule, black, smooth, shiny.

Key to members of the genus *Agrostocrinum*

1. Tepals 7–9 mm long. Inflorescence not exceeding leaves ..... **1b. A. scabrum** subsp. **littorale**
1. Tepals 12–16 mm long. Inflorescence exceeding leaves
  2. Inflorescence axis glabrous. Leaves broad, glaucous ..... **1a. A. scabrum** subsp. **scabrum**
  2. Inflorescence axis scabrid. Leaves narrow, green ..... **2. A. hirsutum**

1. Agrostocrinum scabrum (R. Br.) Baillon, *Bull. Mens. Soc. Linn. Paris* 142: 1119 (1894); Hist. l. 12: 541 (1894). – *Stypandra scabra* R.Br., Prod. 279 (1810). *Type:* Bay 1 [Lucky Bay, Western Australia], R. Brown Inter Australiense 5678. (*lecto:* BM (extreme right hand piece on sheet bearing Robert Brown's tag labelled 'Anthericum, Bay 1, South Coast. 1 sp. *Stypandra scabra* prodr.') *fide* Henderson, Fl. Australia 45: 466 (1987); *isolecto:* BM).

Tufted *perennial herb*, with 4–10 flowering stems 0.15–1 m tall; rhizome short or rarely elongated to several m long. *Roots* yellow-brown, 1–2 mm diam. *Aerial stems* generally not branched, flattened, sharp along sides, both margins entire. *Leaves* green or glaucous, 4–40 cm long, 1.5-6 mm wide, ensiform , unifacial for basal 30 mm, open and flattened for top 10–15 mm, apex acute. *Inflorescence* terminal, glabrous, a continuation of the aerial stems, corymbosely branched to 30 cm long and 30 cm wide, either greatly or not exceeding the leaves, bracteate. *Main bract* leaf-like, linear, 10–60 mm long, glabrous. *Floral bracts* leaf-like, 4–10 mm long. *Pedicels* glabrous, 10–25 mm long. *Perianth segments* dark blue or blue (white flowered plants have been recorded), 8–16 mm long, 4–8 mm wide, glabrous on both sides or with a few scabrid hairs on outer surface of sepaline tepals. *Anthers* twisted away or clustered around style, *c.* 6 mm long. *Style* 7–9 mm long. *Fruit* to 5 mm wide, glabrous. *Seeds c.* 3 mm long.

Distribution. Extends from near Watheroo to Cape Arid in Western Australia. There are a few scattered localities on clay soils on the Swan Coastal Plain, on granites through the northern Jarrah Forest and on coastal granites west of Albany to Augusta.

Notes. Two subspecies are recognised. One is a widespread robust glaucous outbreeding form that occupies most of the species range. The other is a green leaved, inbreeding form that occurs on coastal granites from Mt Manypeaks to Augusta.

1a. Agrostocrinum scabrum (R. Br.) Baillon subsp. **scabrum**

Tufted *perennial herb* from a short or rarely elongated rhizome 20–40 cm diam., with 4–10 flowering stems. *Leaves* glaucous, 30–40 cm long, 5-8 mm wide, ensiform, unifacial for basal 30 mm, lamina open and flat for top 10–15 mm. *Inflorescence* terminal, exceeding the leaves, to 30 cm long and 30 cm wide. *Pedicels* 20–25 mm long. *Tepals* dark blue, 14–16 mm long, 6–8 mm wide, glabrous. *Anthers* twisted away from style, shorter than style. *Style* 8–9 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Mt Ney, 33°24'S, 122°28'E, 1 Oct. 1983, *M. Burgman & S. McNee* 2509 (PERTH); 6 km N of Bolgart, 31°13'S, 116°30'E, 3 Nov. 1956, *J.W Green* 551 (PERTH); Tagon Bay, Cape Arid National Park, 33°52'S, 122°59'E, 16 Oct. 1991, *W. Greuter* 22887 (PERTH); Brixton St, Beckenham, 32°01'S, 115°58'E, 19 Nov. 1982, *G.J. Keighery* 5391 (PERTH); Charles Gardner Reserve, S of Tammin, 31°52'S, 117°29'E, 17 Nov. 1970, *R.D. Royce* 9319 (PERTH).

Distribution. Extends from near Watheroo to Cape Arid Western Australia. There are a few isolated populations on clay soils on the eastern side of the Swan Coastal Plain from near Perth to Waterloo and in the Jarrah Forest around granites. Apparently there is a disjunction between the northern populations and those along the south coast. (Figure 1A).

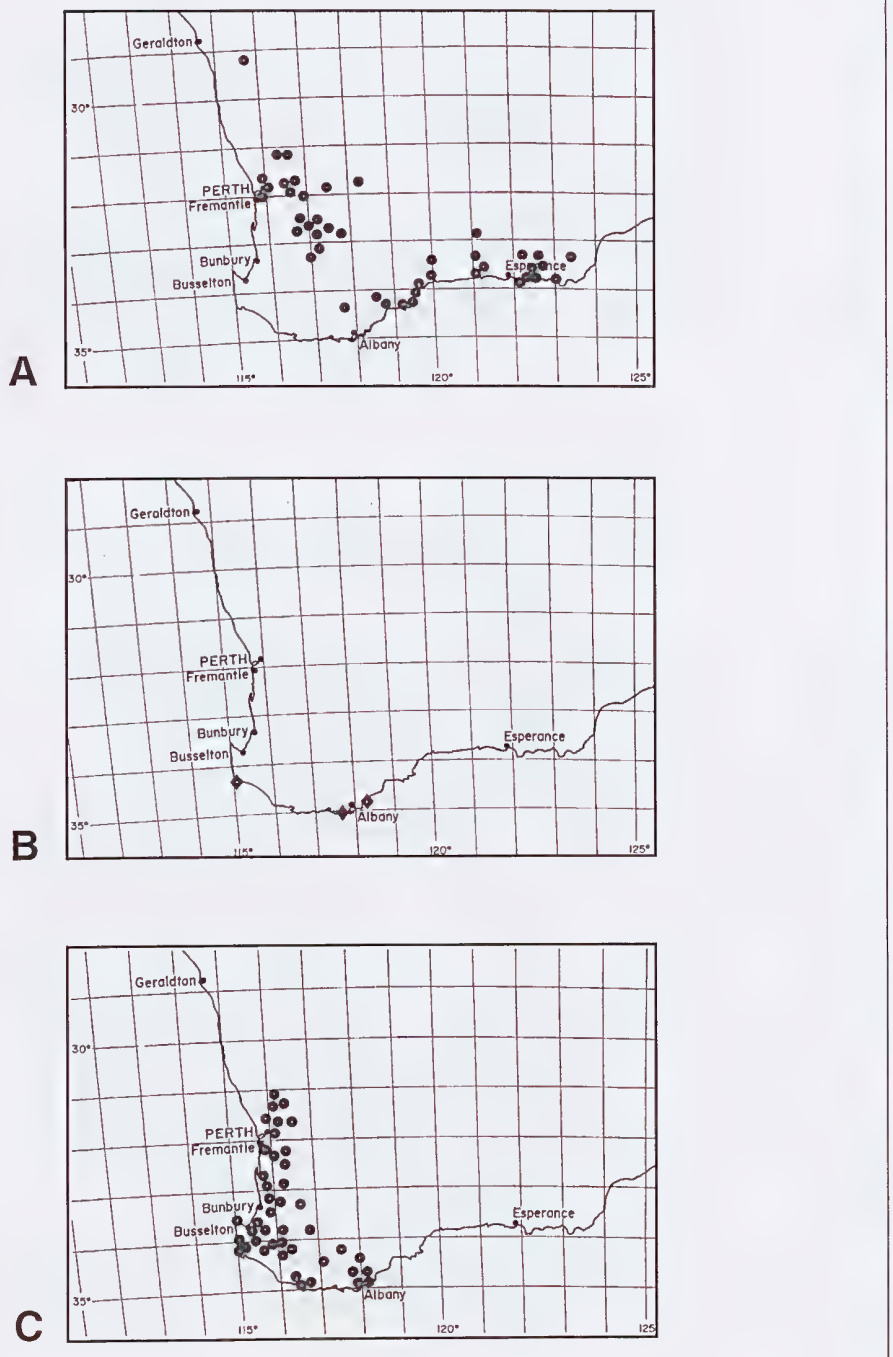

Figure 1. Distribution maps. A – *Agrostocrinum scabrum* subsp. *scabrum*; B – *A. scabrum* subsp. *littorale*; C – *A. hirsutum*.

Habitat. In a wide variety of plant communities ranging from Eucalypt woodlands, *Banksia* woodlands, mallee, shrublands and heath. Usually on lateritic or duplex yellow sands in the Avon – Wheatbelt IBRA Bioregion (Thackway and Creswell 1995), but also on grey sands and sandy clays. Along the south coast the species is frequently found on granite and quartzite hills.

Phenology. Flowers: September to November, extending into December on the south coast. Mature capsules are found from November to January.

Conservation status. Widespread and well conserved.

Etymology. From the Latin *scabrum*, meaning rough or gritty to the touch, on the account of numerous small projections, from the few scabrid hairs found on the inflorescence in the south coast variant of the species.

Discussion. In the field this subspecies can be readily distinguished from *Agrostocrinum hirsutum* by its undivided aerial stems and larger glaucous leaves. The inflorescence is larger, more branched and open with long glabrous pedicels and peduncles with no or few glandular hairs. The sepals are not scabrid on the outer surface.

This subspecies appears to be composed of two disjunct variants. Populations from the northern part of the species range are large robust plants with broad glaucous leaves and completely glabrous flowers and inflorescence. These populations occur on clay soils on the Swan Coastal Plain, rarely on granites along the Darling Escarpment, then disjunct to the western Wheatbelt (Bolgart, Northam, York, inland to Quairading and Muntadgin and south to Kojonup).

The other variant is a more slender plant with thin leaves and, especially near the coast, a few scabrid hairs are found on the floral parts. It occurs in the south-east portion of the species range from near Albany to Israelite Bay, usually on granites, quartzite hills and ranges. There is, however, overlap in characters along the inland margins and the disjunction may prove to be less distinct with more intensive collecting.

1b. Agrostocrinum scabrum subsp. **littorale** Keighery, *subsp. nov.*

Differt a *Agrostocrinum scabrum* statura minore, folia viridia, inflorescentia brevis, non excedens folia et flores parvus.

Typus: Mount Manypeaks, 40 km E of Albany, 34°54' S, 118°16' E, 27 Nov. 1987, *G.J. Keighery* 8846 (*holo*: PERTH 01963481).

Rhizomatous *perennial herb*, to 15 cm tall by 1 m wide. *Leaves* green, 4–12 cm long, 1.4–2.5 mm wide. *Inflorescence* glabrous, not exceeding the leaves. *Pedicels* 10–13 mm long. *Tepals* blue, 7.8–8.6 mm long, outer surface with a few scabrid hairs towards the base. *Anthers* straight, clustered around style, equal in length to the style. *Style c.* 7 mm long.

Other specimens examined. WESTERN AUSTRALIA: Cape Leeuwin by Rangers House, Western Australia, 4 Nov. 1978, *G.J. Keighery* 1914 (KP, PERTH); Mutton Bird Island, *G.J. Keighery* 5809 (PERTH).

Distribution. Western Australia. Known from three disjunct populations at Mt Manypeaks, Mutton Bird Island and Cape Leeuwin (Figure 1B). All of these populations are within the range of *A. hirsutum*. At Mt Manypeaks the two are parapatric within 50 m (vouchers *G.J. Keighery* 8845 and *G.J. Keighery* 8846, PERTH) and no intermediates were recorded.

Habitat. Found on shallow granite loams in low open heath on granite slopes overlooking the sea.

Flowering and fruiting time. October to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Occurs in Leeuwin–Naturaliste and the proposed Waychinicup National Parks.

Etymology. From the Latin *littoralis* – pertaining to the sea shore, a reference to this subspecies occurring close to the ocean.

Discussion. This distinctive inbreeding subspecies of *Agrostocrinum scabrum* differs in having green leaves, smaller flowers than the type subspecies, shorter erect anthers that are as long as the style and which cluster around the stigma. The inflorescence does not exceed the leaves and at Cape Leeuwin the plants are clonal and polyploid. It could be argued that this taxon deserves specific status.

2. Agrostocrinum hirsutum (Lindl.) Keighery, *comb. nov.*

Caesia hirsuta Lindl., Sketch Veg. Swan Riv. Col. 57 (1840). *Type*: Swan River Colony [Western Australia], syn: Drummond 775 & 776 CGE, *n.v.* (photo *fide* A.S. George).

Agrostocrinum stypandroides F. Muell., Fragm. Phytog. Austr. 2 (13): 95 (1860). *Type:* Vasse River, *Oldfield* (*lecto:* MEL 1531244, *fide* Henderson, Fl. Australia 45: 466 (1987)). *Excluded syntypes:* Hay River, Oldfield (MEL 1531242, 1531245); Tone River, *Oldfield* 632 (MEL 1531205); Phillips Flats, *Oldfield* 130-1 (MEL 1531243). The excluded syntypes are all of *Agrostocrinum scabrum*.

Slender tufted *perennial herb*, with 3–8 flowering shoot to 0.6 cm tall, usually less; rhizome abbreviated, 10–20 cm diam. *Roots* yellow, 15–20 cm long, 1–2 mm diam. *Aerial stems* flattened, 2–3 mm wide, sharp on sides, entire. *Leaves* green, 10–40 cm long, 2–4 mm wide, folded for basal 30–60 mm, margins smooth, entire. *Inflorescence* few-branched, 100–120 mm long, basal 30–40 mm smooth, rest scabrous. *Main bract* 30–40 mm. *Floral bracts* linear-subulate, 5–7 mm long. *Pedicels* erect, slender, 12–15 mm long, scabrous. *Perianth segments* dark blue, 12–16 mm long, 6–8 mm wide; sepals scabrid on undersurface. *Anthers* twisted away from style, *c.* 6 mm long, curved. *Style* 8–9 mm long. *Fruit* to 6 mm wide, covered with scabrid hairs. *Seeds c.* 3 mm long.

Other specimens examined. WESTERN AUSTRALIA: Collie, 33°22'S, 116°09'E, 2 Nov 1988, *J.J. Alford* 1074 (PERTH); Red Hill, 31°52'S, 116°03'E, 6 Nov 1958, *T.E.H. Aplin* 305 (PERTH); Castle Rock Walk, Porongurup National Park, 34°07'S, 117°55'E, 19 Nov 1983, *E.J. Croxford* 5723 (PERTH); Hooley Road, Leeuwin–Naturaliste National Park, 34°07'S, 115°01'E, 28 Nov. 1989, *N.G. Gibson & M.L. Lyons* 418 (PERTH); Coolup, 32°45'S, 115°52'E, 25 Oct. 1897, *R. Helms s.n.* (PERTH); Mount Manypeaks, 27 Nov. 1986, *G.J. Keighery* 8845 (PERTH); 22 km S of New Norcia, 31°10'S, 116°13'E, 13 Oct. 1977, *C.I. Stacey* 619 (PERTH).

Distribution. Occurs west of a line from New Norcia south to Mt Manypeaks, Western Australia. (Figure 1C).

Habitat. Usually found in woodlands (of *Eucalyptus marginata*, *E. marginata* and *Corymbia calophylla*, *C. calophylla*, *E. wandoo*, *E. cornuta, Banksia attenuata / B. menziesii*), Heath or sedgelands. Occurs often on sandy soils, lateritic soils or granites.

Phenology. Flowers September to November and extending into December in the wetter areas of the forest. Mature capsules can be found from November to February.

Conservation status. Widespread and well conserved.

Etymology. The epithet *hirsutum* refers to the scabrid hairs present on the inflorescence axis, pedicel and outer surface of the sepals.

Discussion. Lindley did not designate a type. It is likely that the species is based on a Drummond collection, of which two, *Drummond* 775 and 776. Alex George kindly searched Cambridge and located both collections, labelled as *Caesia hirsuta* in Lindley's hand. One of these could be selected as a lectotype.

Alex George compared the material and is in no doubt from the collections that this is the correct name for the western species of *Agrostocrinum*. This supposition is further enhanced by the following passage describing the species. This material was collected by Georgiana Molloy around the Vasse River and sent to England as seed. In June 1842 George Hailes of Newcastle reported (Hasluck 1955: 239) that he "had flowered the first novelty to our gardens which the seeds from Swan River you so kindly sent me two years have produced with me. I had hoped it was new and intended to ask my friend Sir William Hooker to figure it with my name of '*Caesia molloyae*', as a fitting memorial of a fair lady to whose exertions we owe so much and who has been so ungallantly overlooked by all describers of her collections, but on examining Lindley's sketch I found it was described as '*Caesia hirsuta*'."

Of particular note is that while the two species overlap little in range, they are parapatric on the Darling escarpment at Wandoo Heights in the Shire of Swan, occurring in closely adjacent habitats with no evidence of hybridization and some differentiation in flowering times (vouchers *G.J. Keighery* 16209 and 16210).

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